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WEEDING AND FERTILIZATION OF RICE
IN YIN HSIEN SPECIAL ADMINISTRATIVE DISTRICT

[Comment and Summary: This report gives information from Chapters 3, 4, 10, 17, 18, and 19 of the monograph Yin Hsien (Ning-po) Chuan-ch'u Nung-yeh Sheng-ch'an Ching-yen Chieh-shao (An Introduction to the Agricultural Production Experiences of the Ning-po Special Administrative District) by Liu Iu-hsiang, published by the Hsin-hua Shu-tien Hua-tung Tsung-fen-tien, in Shanghai.]

Agricultural production in Yin Hsien (called by the local people Ning-po) Special Administrative District, Chekiang, has not been sufficiently high. From investigation, it was determined that many of the farmers did not know the proper agricultural techniques, particularly for weeding and fertilizing. Farmers were advised to give greater attention to reducing fertilizer loss and to promoting rapid plant growth. Farmers were also advised to learn methods of applying fertilizer and how to make their own fertilizer by using materials easily obtained.]

Weeding and Fertilizing Rice

At present (25 May), the transplanting phase for paddy rice has been completed in the majority of areas, and the weeding and fertilizing of rice fields have commenced. From investigation it is apparent that farmers still do not understand clearly the processes of weeding and fertilizing. Fertilizer is being applied indiscriminately with the result that production is lowered.

1. Weeding

Weeding is simply the removal of various grasses to reduce fertilizer loss, to loosen up the soil, and to benefit root growth.

Approximately 8 days after transplanting, the first weeding should be begun. This initial weeding must be deep so that the rootlets of the rice plants can grow uniformly in a downward direction. Thereafter weeding should be done once every 10 days (but not too deeply since roots may be damaged) until the rice plants begin to sprout.

Weeding must be done thoroughly because weeds absorb more fertilizer than rice plants. Of the various weeds, the darnel weed is the most harmful and particular attention must be given to its removal. To distinguish the darnel weed from the rice sprout, note that rice sprouts have leaves and darnels do not, that the color of rice sprouts is light green but darnel weeds are dark green and that the central vein in the rice leaf is not too prominent whereas that of the darnel is very prominent and is white. Darnel weeds should be thoroughly removed before the rice plants sprout, otherwise growth will be impeded and yields reduced.

In the rural areas most farmers weed by hand which is much too slow and tedious. New type farm implements such as iron tooth harrows should be used for faster and easier operation.

At the time of weeding, water should be drained from the fields, leaving about one inch of water to protect the roots of the plants.

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2. Fertilization

The most widely used fertilizer in the rural areas is night soil. Next are direct fertilizers such as grass and wood ashes, manure-earth mixtures, stable manure, tungseed cake, rapeseed cake, vegetable tallow cake, chicken feathers, hog hair, and bone black. Indirect fertilizers also used are lime, gypsum, ammonium sulfate, and others. In the Yin Hsien coastal regions ordinary fertilizers are insufficient so supplementary fertilizers such as bean cake and powdered fertilizer (ammonium sulfate) are utilized. Experienced farmers say that the most effective fertilizer is still tzu-yun-ying (*astragalus sinicus*).

From knowledge gained from experiments conducted by the Chekiang agricultural industry, it is apparent that more attention should be given to some methods of fertilization. The most important are listed below:

- a. Earth-manure mixtures and night soil should be thoroughly decomposed before being applied to the fields.
- b. Bean cake or night soil should not be repeatedly added to soil already fertile. A little grass and wood ashes, bone meal, or bone black should be used instead.
- c. The use of grass and wood ashes on diseased or insect infested fields is sufficient. Nitrogenous fertilizers are not needed on these fields.
- d. The nature of powder fertilizers is not clear so their use should not be indiscriminate or in large amounts.
- e. When green fertilizer is plowed under, a little lime should be added to hasten decomposition.
- f. Basic fertilizer should be applied 2-3 weeks before transplanting. Follow up fertilizer should be applied before the rice heads begin to fill up.
- g. At the time of fertilizing, the water in the fields should be shallow, and after fertilizing, the fields should be plowed and weeded so that soil and fertilizer are well mixed. It is not necessary to irrigate or drain the fields immediately.
- h. Fresh night soil has elements of urine in it so a little bean cake fertilizer should be added to dilute the urine.
- i. The resistance of nonglutinous rice to fertilizer is stronger than that of common rice so a little more fertilizer should be applied to nonglutinous rice fields.
- j. All types of fertilizers are not compatible to each other. For example, stable manure and night soil, if combined with lime or grass and wood ashes, will lose their fertilizing effect.

Caution should also be exercised during the irrigation and draining of fields, especially within the 10-day period after transplanting. Paddy rice fields may be irrigated rather deeply, 1 1/2 or 2 inches, but never over 3 inches. The shallowness of the water is not important, but by no means should the fields be dry. Irrigating and draining of rice fields are very beneficial since these methods regulate soil temperatures, circulate the air, and promote crop growth.

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Fertilizer Application in Yin Hsien

The methods of applying fertilizer in Yin Hsien are relatively advanced. Two types of methods, one for the lowlands and the other for mountain areas, are used:

1. Lowlands (two-season rice, Chiang-shan Ch'u as Examples)

a. Night Soil

At the time of the second or third weeding of the rice fields (that is, 2-4 weeks after transplanting), the fields are drained so that water is about 1/2 inch in depth, approximately 10 piculs of night soil are applied and weeded again. Two days after the completion of the weeding, the fields are irrigated again. Weeding and fertilizing should be carried out in clear weather otherwise fertilizer effectiveness is reduced.

b. Bean Cake

There are two methods of using this type of fertilizer. First, the bean cake is pulverized, strained through sieves, and then applied directly to the fields both before and after the summer season. Bean cake fertilizer can either be scattered about quite heavily, at 33-40 catties per mou, or concentrated more economically around the shoots at 25-30 catties per mou. In the second method, the bean cake is thrown directly into night soil containers for purposes of fermentation and after a definite period (about 15 days), is applied to the fields at the beginning of autumn as preparation for the second crop of rice. According to experienced farmers, both methods have been equally effective.

c. Alum

This type of fertilizer is little used by the farmers. Generally it is used in grassy fields to hasten the rotting of grass so that rice plant growth will not be impeded after transplanting.

2. Mountain Areas (single-season rice, Chang-mi Hsiang as Example):

a. Human Excreta

In the mountain areas, the purchase of human excreta is not convenient and transportation is difficult. Hence, other than using their own excreta for fertilizer, the farmers in the mountain areas generally use stable manure and green manure.

b. Green Manure

At the time of the second weeding, dried green manure (the young leaves of the Chai-tzu tree are the most effective) is added to the paddy fields, and after 4 or 5 days this manure decomposes and turns black. Care must be taken when draining the fields that the black colored water which contains the fertilizing elements is retained. When the water is at the 1/2 inch level, the muddy earth can be stirred so that the decomposition of the manure is hastened.

c. Bean Cake

No matter how difficult their economic situations are, the farmers of Yin Hsien try to purchase cake-type fertilizers since its transportation is convenient and its fertilizing qualities very effective. The application of cake-type fertilizers is similar to the methods used in the lowlands. The fertilizer is applied in the summer when the grain is in ear.

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d. Grass and Wood Ashes

"Urine-ash mixtures" are applied to the fields at the time of the third weeding. (According to scientific theory, it is absolutely impossible to combine these two elements without a decrease in fertilizer effectiveness.) Prior to the third weeding, accumulated grass and wood ashes are mixed with human excreta. This compound, called "urine-ash mixture," is applied to the drained fields 2 days after completion of weeding and is said to be suitably effective.

Mid-Season Plowing, Weeding, and Fertilization of Wheat

During the winter, farmers are accustomed to planting winter crops to supplement shortages of food. Production is low, however, because mid-season plowing, weeding, and fertilization methods have not been effective. The methods used by the farmers in all the hsien of Yin Hsien Special Administrative District are generally incorrect. For example, many agricultural households in Yu-yao Hsien combine grass and wood ashes with night soil, but according to scientific theories and experimental results, fertilizer effectiveness is lost when these elements are combined. In areas where wheat is grown attention should be given to the following techniques:

1. Mid-Season Plowing and Weeding

These two operations are often carried out simultaneously. Plowing loosens the soil permitting wheat roots to grow freely without hindrance; weeding reduces fertilizer loss. The coldness and moisture of the winter can also damage wheat, therefore it is necessary to dig ditches around the fields to facilitate drainage. The excavated earth can be piled up to serve as protective barriers.

2. Fertilization

Wheat fertilization should be quite heavy since wheat draws heavily on fertile elements in the soil. In general, earth-manure mixtures, grass and wood ashes, and night soil are considered the best. The most effective time for the use of earth-manure mixture and grass and wood ashes, however, is during plowing and sowing. The amounts of fertilizer used per mou are: follow-up fertilizer 700 catties, grass and wood ashes 100 catties, night soil 800 catties. The four periods of application are: prior to winter, end of agricultural year, early spring during February, first 10 days of March. An application of 20 catties of bean cake per mou prior to winter is also of great benefit.

Attention must be given to the amounts of fertilizer used and its adaptability (night soil, earth-manure, stable manure cannot be used with grass and wood ashes or mineral fuel ashes). Fertilizer with high nitrogen or phosphorous content, used alone or in combination, does not increase fertilizer effectiveness, but rather helps to promote the danger of wheat rust. Caution must be exercised in the use of fertilizers with nitrogen, phosphorous, or potassium content.

Fertilizer Accumulation and Winter Cultivation

The best method of increasing agricultural production is to reclaim wasteland and to expand cultivated area. Even this, however, does not ensure a production increase if there is a shortage of fertilizer. It is necessary at this time, when both chemical and organic type fertilizers are lacking, to resolve this problem.

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Experienced farmers say that pond mud is extremely beneficial so in times of shortage this mud can be utilized. Garbage for making compost, grass and wood ashes, mineral fuel ashes, and animal excreta can also be used.

Winter cultivation and irrigation are of utmost importance to agricultural production. Based on recent investigation, the farmers of the Yin Hsien area of Chekiang are not too familiar with winter cultivation and irrigation. This has led to a decrease in production and a greater susceptibility to insect infestation. There are two advantages to winter cultivation: First, the soil is loosened and permits aeration. Second, the cold can kill off insects and reduce subsequent damage. It is hoped that local authorities will mobilize the masses to institute winter cultivation and irrigation to ensure an increase in production.

Additional Opinions on the Making of Compost

The author, having read an article on "How to Make Compost" by Kao I-chiang in the Yung-chiang Jih-pao of 5 January 1950, feels that a few additional opinions on the solution of the fertilizer problems can be advanced. [The article by Kao is appended.]

Garbage and waste do not ferment easily in a short period of time. To hasten decomposition, some silkworm chrysalises, dead inedible organisms, animal bristles, horns, hoofs, blood, etc., can be mixed with the garbage and waste. After about 3 weeks, composting mixtures should be turned and mixed once, and an amount of super lime phosphate equivalent to 5 percent of the total mixture can be added at that time. Thereafter, the compost should be turned every 3 or 4 weeks but no additional ingredients are required.

Compost is made from the combination of all types of wastes, and its quality is not unlike that of stable manure. The effectiveness of compost lies in its ability to maintain the oxygen content of the soil, and to strengthen other elements. All composts have three main elements: Nitrogen, .001-.030 strength (grass, human excreta, pond mud); phosphorous, .002-.050 strength (cow bones, powdered hog bones); potassium, .002-.010 strength (bean stalk ashes, wheat stalk ashes, grass and wood ashes).

All farmers use natural fertilizers such as night soil, vegetation, pond mud, bean cake, compost, etc., which, although they do not contain the same fertilizing elements and do not effect various crops in the same manner, have been effective for many centuries.

Last to be mentioned is the powdered fertilizer ammonium sulfate. This fertilizer should not be used alone since its usage alone is detrimental rather than beneficial to the soil. The best manner in which to use ammonium sulfate is by mixing it with phosphorous or potassium fertilizers.

HOW TO MAKE COMPOST

Kao I-chiang

The most pressing problem at present is the shortage of fertilizer. The situation is similar in all the villages; wheat and soybeans have been planted in greater quantity than last year, but the problem is still the lack of fertilizer. However, the farmers all realize that the government is poor at present and that relief efforts have been insufficient. To resolve this present difficulty there is a simple and economical method.

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The rural areas have always had an abundance of miscellaneous straw, night soil, and stagnant water. All this waste can be collected and allowed to ferment into a good fertilizer--compost.

The making of compost is simple. Dig a pit 1-2 feet deep and 5-8 feet square in a suitable location, tamp the bottom and four sides of the pit and dig a drainage ditch around the pit. After the pit is constructed, collect night soil, straw, garbage, stagnant water, leaves, etc., for composting. First, a layer of straw, or leaves to a depth of one foot is spread on the bottom of the pit, and then about 5 inches of night soil and pond mud is added. This mixture is tamped down firmly and 1-2 piculs of urine poured over it. This entire process is repeated again until the material is all used up and the heap is 2-3 feet above the surface of the pit. As a final step, spread about 5 inches of mud over the whole pile.

After about 2 months the compost should be turned and more urine poured over it to maintain uniform fermentation. After another 2 months, the compost is ready for use. It can be used either as basic fertilizer for rice, corn and potatoes, or as follow-up fertilizer for wheat and oil bearing crops.

This method of making compost is widely used in areas of Chekiang, and farmers in those areas know that the compost is very effective and economical.

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